

Healthcare Surge Capacity for Pandemic Flu

Who and what is needed?
Can you find the who and what?

...with an emphasis
on children



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Dry Bones

THOSE PIGS!

FOR YEARS THEY'VE
BEEN TRYING TO
FRIGHTEN US WITH
DIRE PREDICTIONS



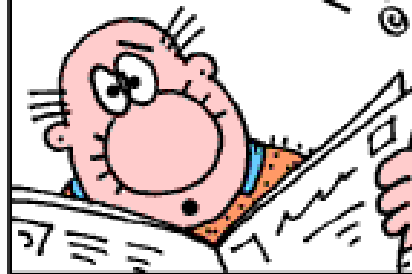
OF A DEADLY
WORLD-WIDE
EPIDEMIC OF
BIRD FLU



AND, AFTER
ALL THE TALK,
IT JUST NEVER
HAPPENED!!



OINK!



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Definitive Care for the Critically Ill During a Disaster: A Framework for Optimizing Critical Care Surge Capacity

From a Task Force for Mass Critical Care Summit
Meeting, January 26–27, 2007, Chicago, IL

CHEST 2008
133:19s

Task Force suggestion:

“...all hospitals with ICUs should prepare to deliver care for a daily critical care census at three times their usual ICU capacity for up to 10 days.”

This will not be enough for a moderate to severe influenza pandemic...

Pandemic vs Terrorism or Natural Disaster

- ◆ Terrorist events tend to be 'localized
- ◆ Acute natural disasters are local or regional
- ◆ Local responders/providers are acutely stressed
 - But help usually will arrive in 24-72 hrs

- ◆ Flu pandemic is a sustained, widespread event
 - Help is not coming
 - Everyone is "occupied at home"
 - National guards are staying in their home states
 - Military? ...still may not be enough

Pandemic Realities

- ◆ Much uncertainty of threat degree remains
 - Now is time to address surge questions in detail
- ◆ Regional medical centers may not be able to provide expected relief to their referral basin local hospitals
 - Childrens' hospitals, which function as local and regional centers, cannot be expected to receive masses of children from many local areas
 - Lousville/Kosair, Lexington/UK, Cincinnati, Vanderbilt, Huntingdon may be swamped by their local community needs
 - UofL/Kosair, UK, Pikeville will need to work together

Overview of Flu Surge Issues

- ◆ Needs will be dictated by pandemic strain virulence
 - Mix of needs affected by age-specific attack rates
- ◆ Some needs can be met by canceling elective procedures, well child care, other preventive care
 - Will result in a 'mini-surge' of different sort later
- ◆ HCWs will have illness issues – self, family
- ◆ Some 'key suppliers' will be similarly affected
- ◆ Oxygen, oxygen, oxygen...+ masks (but what kind?)
 - Alcohol hand gel (by the gallon)

Flu Surge Oversimplified

- ◆ Ultimately, there are three components of surge capacity
 - STAFF
 - Providers, clerical, security
 - STUFF
 - Equipments, medications, supplies
 - STRUCTURE
 - Physical facilities, management infrastructure
- ◆ Two out of three...

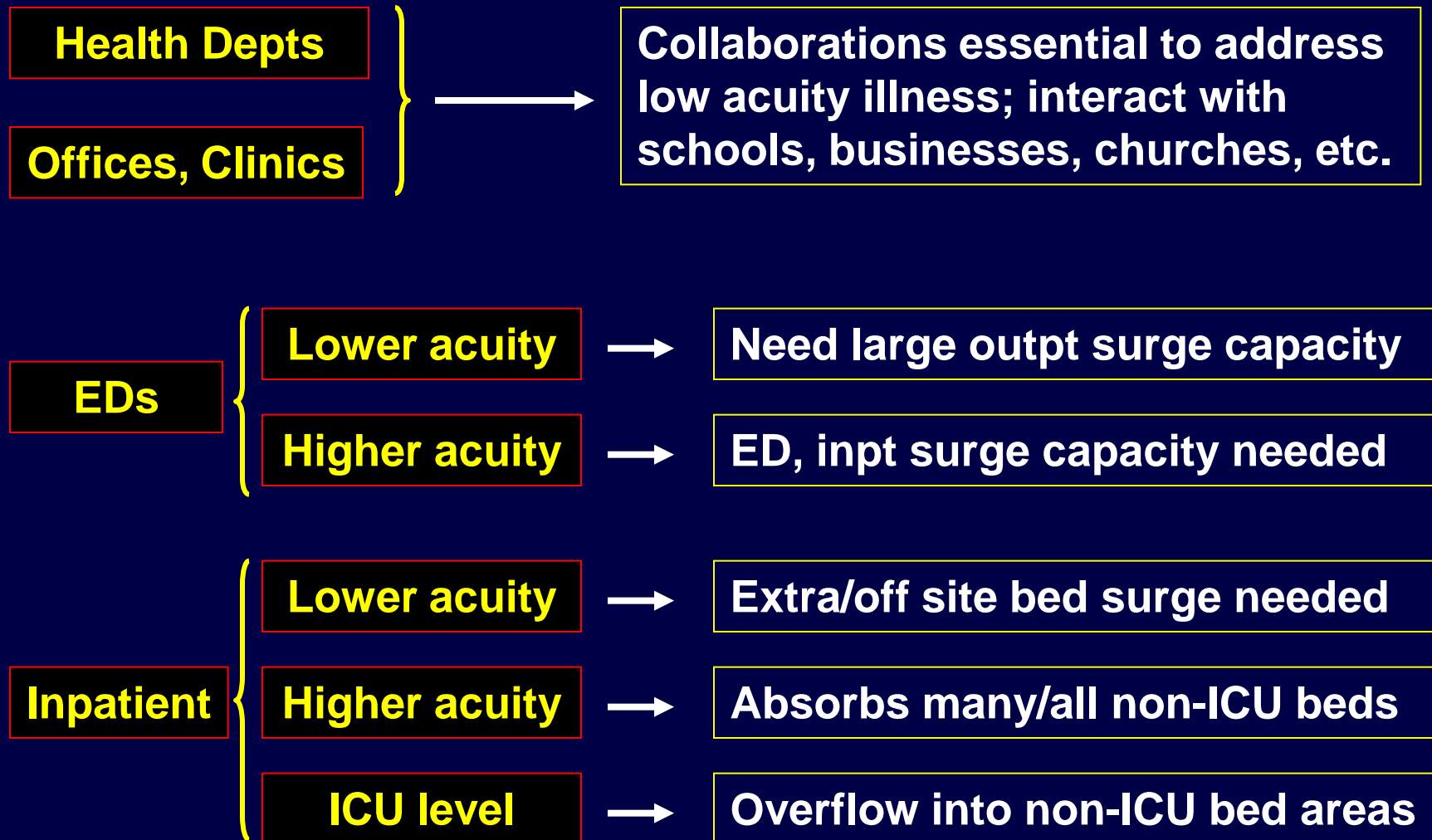
A more complicated view

- ◆ All levels of healthcare system will be impacted
 - Outpatient – offices, clinics
 - Emergency Departments
 - Inpatient settings, ICU and non-ICU
 - All “Ancillary Services”
 - Laboratory, Pharmacy, Respiratory Therapy, Radiology
 - Food Services, Housekeeping, Laundry
 - Clerical support
 - Billing
 - Somebody has to pay for all of this ???

Issues of Volunteers, Shared Personnel

- ◆ Volunteers
 - Retirees with lapsed licenses
 - State-line issues
 - Good Samaritan protections, medical malpractice risks
- ◆ Sharing personnel for public-private, private-private partnerships
 - Who pays for what time?
 - Employment contract issues, union and non-union
 - Overtime????
- These partnerships will be essential
- We will have to have the view/attitude at all levels that
“we are all in this together”

Overview of Surge Need Types



A MASS CASUALTY CARE STRATEGY FOR BIOLOGICAL TERRORISM INCIDENTS



Prepared in response to the Nunn-Lugar-Domenici Domestic
Preparedness Program by the Department of Defense, May 1, 2001

Concept pre 9/11/2001

Two-pronged response

1. Neighborhood Emergency Help Center
2. Acute Care Center

Modular response designed
for 'localized event'

Many strategies can be
translated into pandemic
flu responses...with a
longer time line...

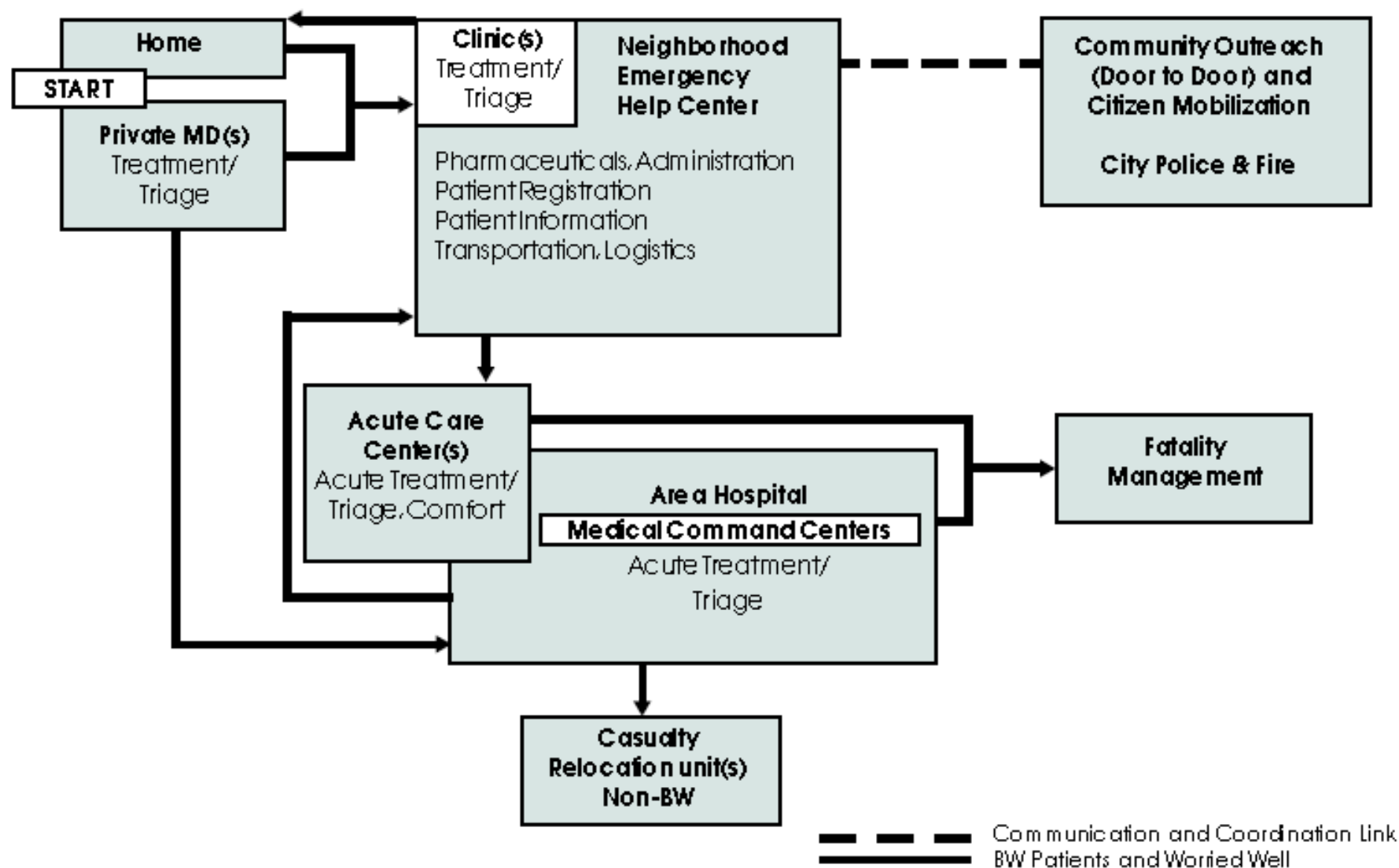


Figure 1 - Modular Emergency Medical System

FUNCTIONS OF THE NEHC

Primarily, the NEHC functions as a high volume point of distribution for prophylactic medications and self-help information. The operational goal of the center is to process 1,000 patients per day.

STAFFING

A Staff of 80 physicians, nurses, pre-hospital care providers, clerical personnel and civilian volunteers are needed to operate a fully functional NEHC per 12-hour shift.

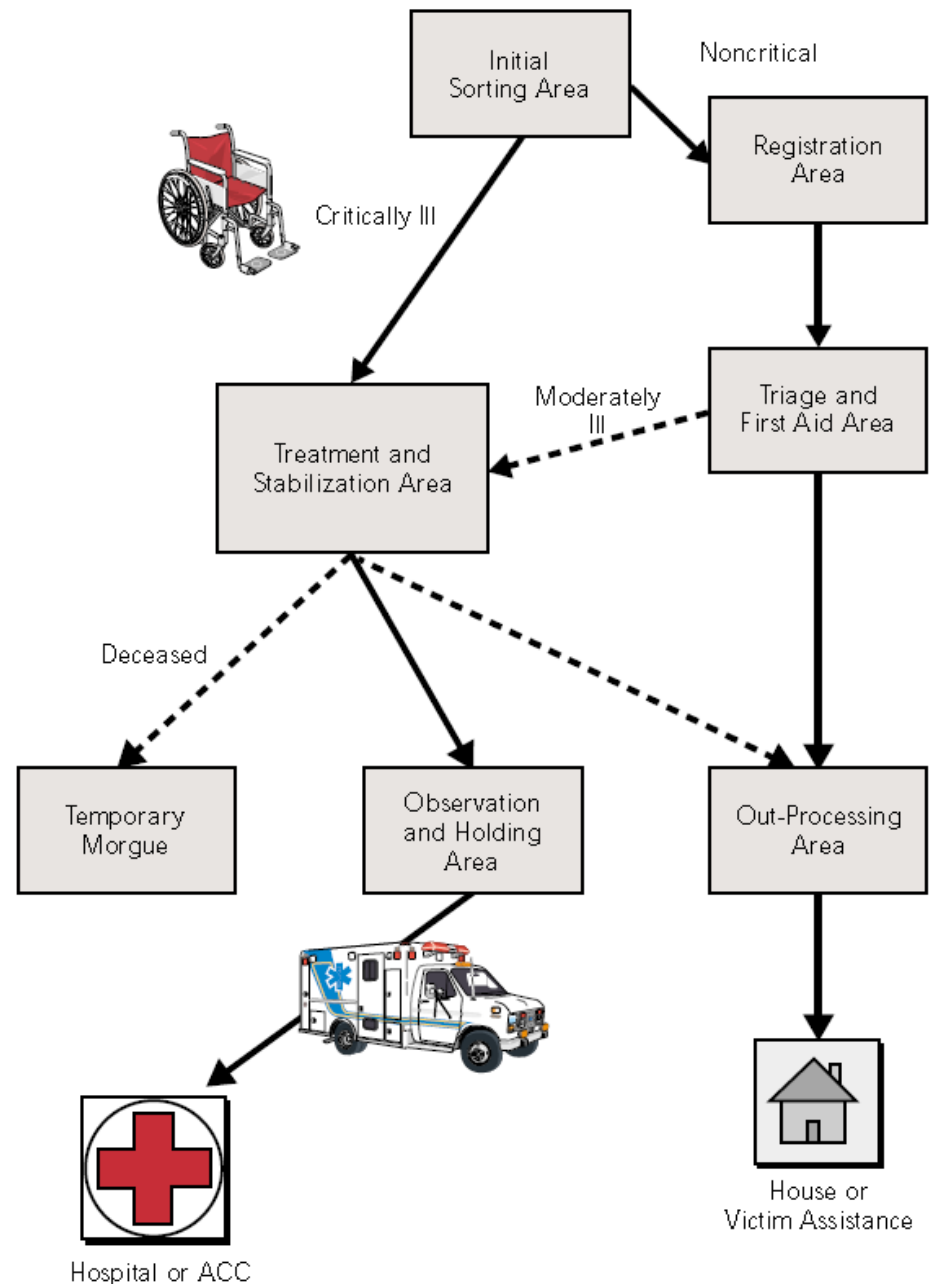


Figure 4. NEHC Patient Flow Diagram

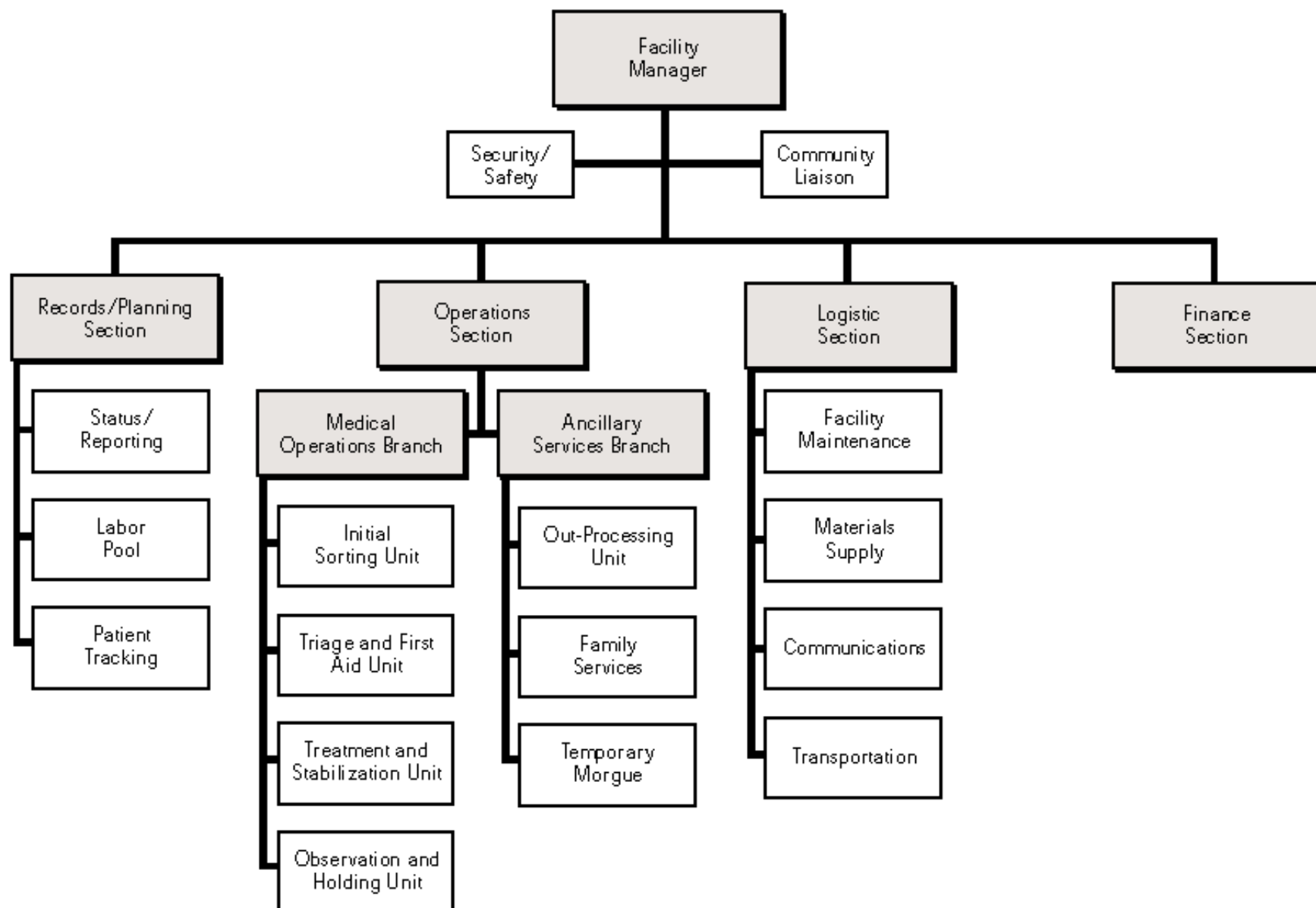


Figure 2. NEHC Command Organization

	Facility Manager	Medical Operations Section Chief	Records/Planning Section Chief	Logistic Section Chief	Transportation Officer	Communication Officer	Maintenance Officer	Physician	Physician Assistant	Family Nurse Practitioner	Nurse	Paramedics	EMT	Clerk	Security Personnel	Housekeeping Personnel	Volunteer	Total
Operations Center	1	1	1	1	1	1							2	1				9
Initial Sorting Area													2	1		2		5
Registration Area													2			6		8
Triage and First Aid Area												5	1			6		12
Out-Processing Area									1	1			2	2		5		11
Treatment and Stabilization Area							3			3	3	1	1		1	5		17
Observation and Holding Area								1		3			2		1	5		12
Temporary Morgue													1			1		2
Service Support Area							1						1			2		4
Total Personnel	→ 1	1	1	1	1	1	1	3	1	1	7	3	6	14	4	2	32	80

Pandemic 'translation' of NEHC

- ◆ Function required for weeks to months, not days, in a moderate to severe influenza pandemic
- ◆ This type of 'unit' would offload work from Hospital EDs, public clinics, private offices
- ◆ > 80 persons required for 1000 pt/day throughput
 - Sustained shifts
 - Worker illness, family issues
 - Credentials
- ◆ Supplies

What about 'inpatient surge'?

- ◆ Modular acute care center for 'event response' has been well designed, but not specifically for a sustained pandemic response...
- ◆ However, many of the principles will be very helpful

PURPOSE

The ACC is only designed and equipped to treat patients who need inpatient treatment but do not require mechanical ventilation and those who are likely to die from an illness resulting from an agent of bioterrorism.

Issues to be addressed up front

- a. Site selection
- b. Parking and access
- c. Building considerations
- d. Total space and layout
- e. Recommended buildings
- f. Doorways and corridors
- g. Electrical supply
- h. Heating and air conditioning
- i. Lighting
- j. Floor coverings
- k. Hand wash facilities
- l. Refrigeration capabilities

Oxygen delivery mechanisms
Other infection control issues
Supply storage
Bathrooms

Traffic Pattern (Patient and Supplies) –
The ACC layout should allow rapid access to every area with a minimum of cross-traffic. Proximity is desirable between the Admissions/Registration area and the nursing subunits. Protection of visual, auditory, and olfactory privacy is important while recognizing the need for observation of patients by clinical staff.

Bed Spacing – Patient care areas should allow at least two feet of clear floor space between beds.

Open ward is more efficiently staffed than private rooms (hotel, clinic space). Security should be considered in planning/implementation.

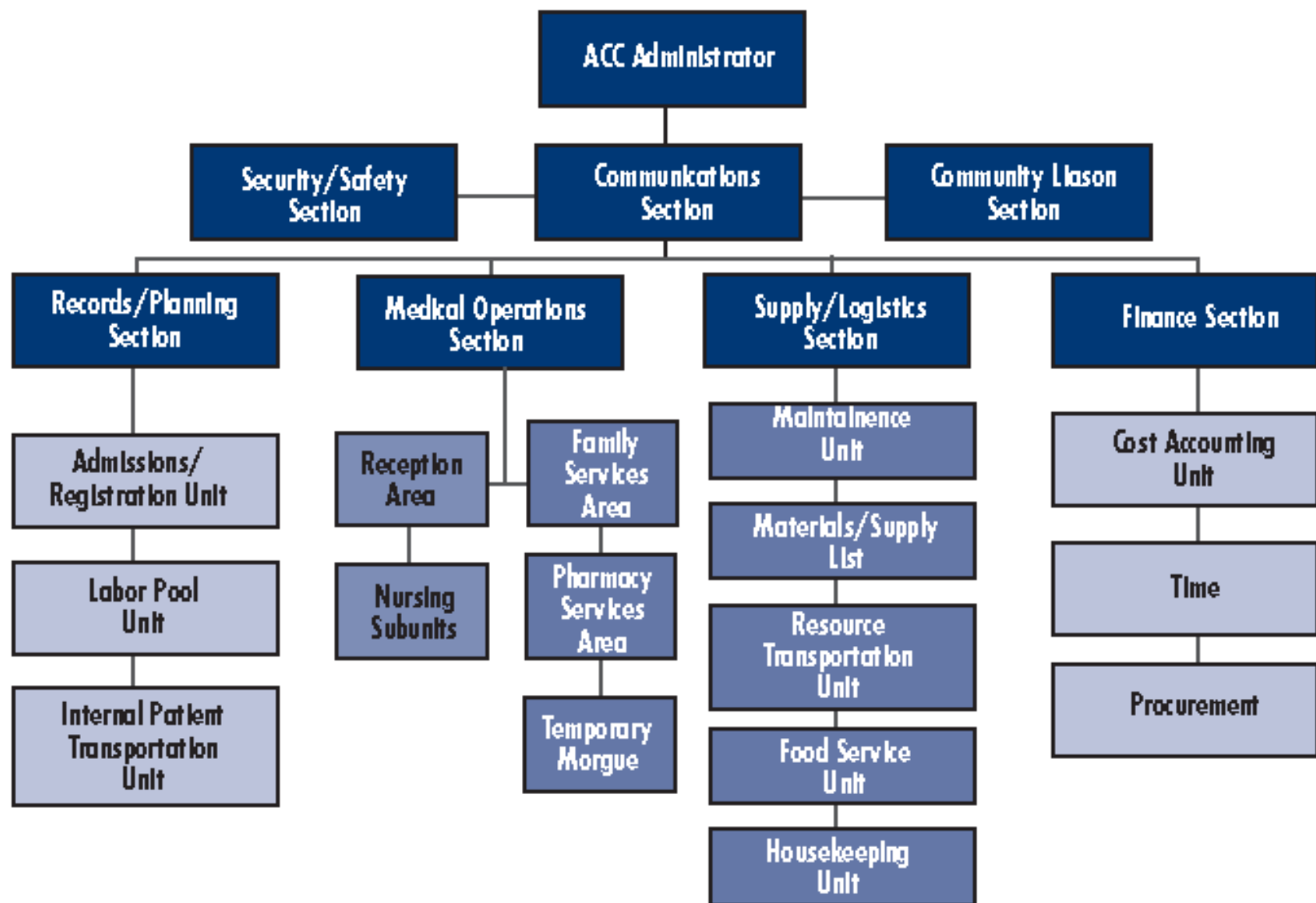


Figure 2. ACC Command Organization

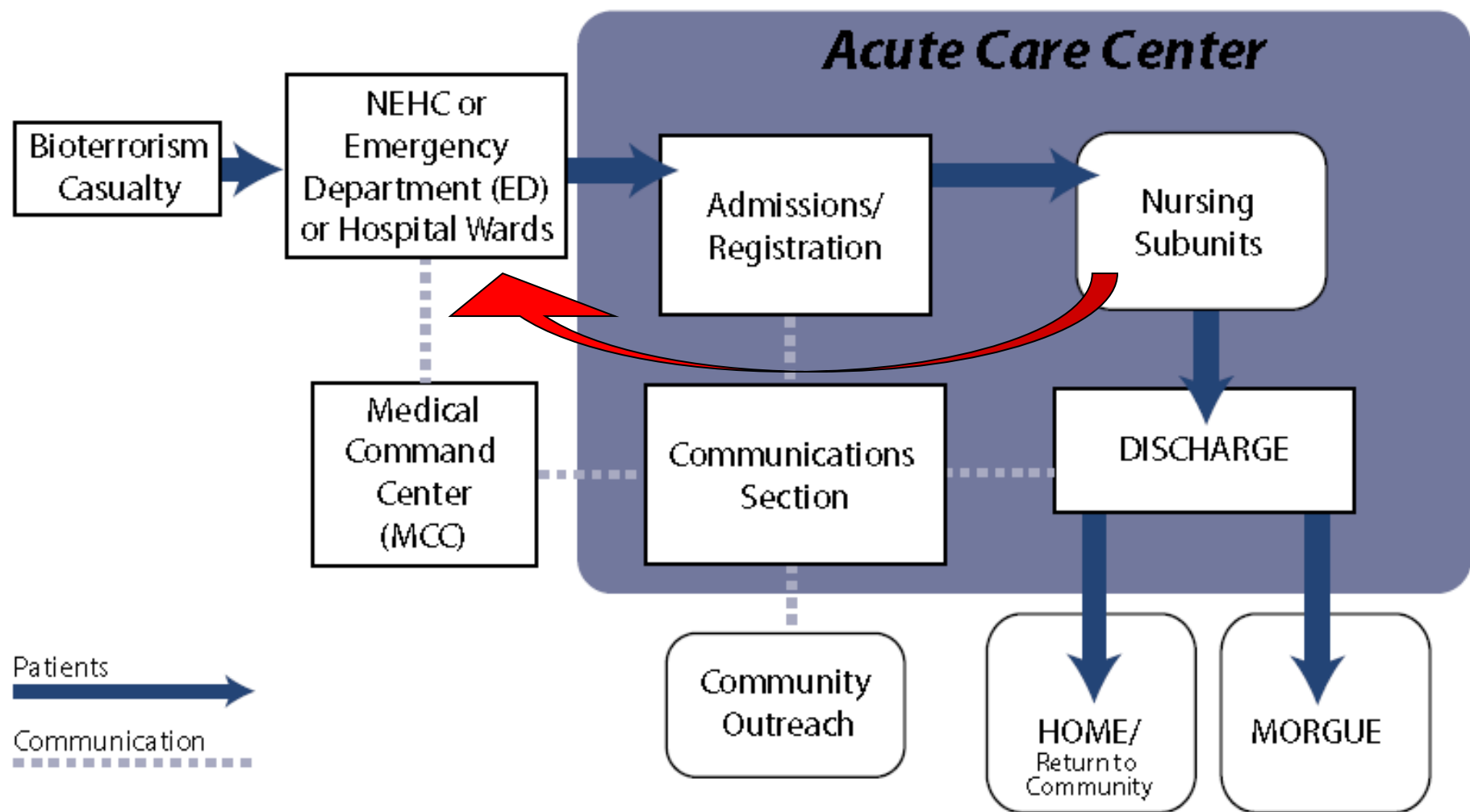


Figure 3. ACC Flow Diagram

Pandemic flu 'set-up' would include transfer back to hospital

Pandemic 'translation' of ACC

- ◆ If 'surge acute care modular unit' is adjacent to a hospital, some of the logistical support functions will not need to be duplicated
- ◆ Medical command center
 - Local health department, private entities in local area must coordinate efforts, communicate frequently
 - Coordinating Center may be a better concept given 'insidious onset' but sustained response needs
- ◆ The outline for surge thus exists...
 - But...
 - Where do you get the staff and the structure?
 - Hopefully we will have the supplies
(at least in the beginning)

Potential Sources of Surge Providers

- ◆ Academic medical centers
 - Faculty physicians on research, admin time
 - Fellows, residents on electives
 - ?? 4th year medical students, ???? 3rd yr students
- ◆ Nursing schools
 - Upper level trainees
 - Nurse practitioner students
- ◆ Other Health Professions students
 - Pharmacy, Technologists, OT/PT, RT
- ◆ Dentists and dental students
- ◆ Able Retirees

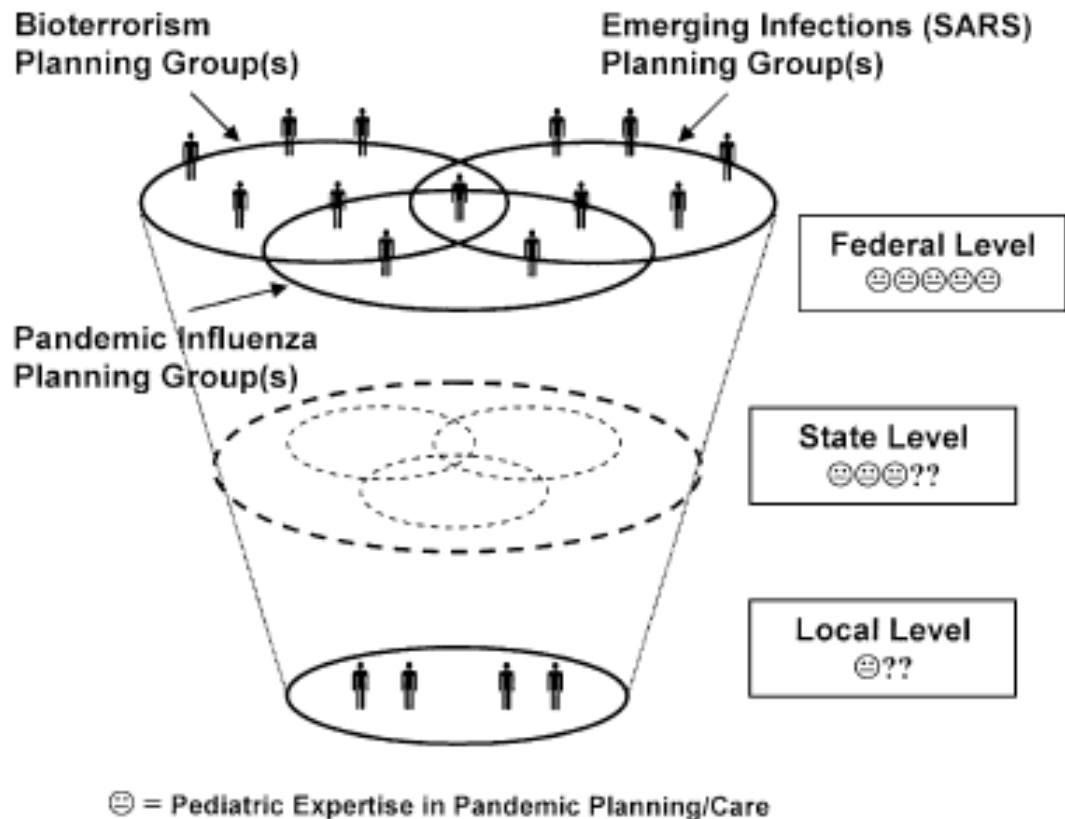
Many people can be called upon to function 'one level up'

Staffing needs for 50 beds per shift

- a. One physician
- b. One physician's assistant (PA) or nurse practitioner (NP) (physician extenders)
- c. Six RNs or a mix of RNs and licensed practical nurses (LPN)
- d. Four nursing assistants/nursing support technicians
- e. Two medical clerks (unit secretaries)
- f. One respiratory therapist (RT)
- g. One case manager
- h. One social worker
- i. Two housekeepers
- j. Two patient transporters

The AOC will likely operate on two rotating 12-hour shifts. The minimum number of staff providing direct patient care on the 50-bed nursing subunit per 12-hour shift is 12, which includes the physician, the physician extenders, nurses, and nursing assistants. The physician will be assigned the entire subunit, while the nursing staff will operate in a team approach. Members of the patient care team will have tasks assigned that are consistent with their scope of practice. ?

**Parents, other caregivers
needed with children**



Configuration of working groups charged with planning and responses to

- 1) Bioterrorism events
- 2) Emerging infections
- 3) Pandemic influenza

At the local level, these are generally the same people.

Pediatric expertise may or may not be available at the local level.

CDC Surge Planning Tools

www.cdc.gov/flu/tools/flusurge

- ◆ FluAid 2.0
- ◆ FluSurge2.0
- ◆ FluLabSurge
- ◆ CommunityFlu 1.0
- ◆ FluWorkLoss
- ◆ These are relatively simple software programs that allow estimates of response needs under different pandemic scenarios

These tools get you to 'front line' estimates,
but not 'food and water' logistics

FluAid 2.0

- ◆ Software designed to assist in providing estimates of potential impact of “pan flu” at state and local levels
- ◆ Age is considered by 3 categories
 - 0-18 yrs, 19-64 yrs, 65+ yrs
 - Least useful for 0-18 yrs (infants ≠ teens)
- ◆ Clinical influenza = flu illness causing a measurable economic impact
 - Examples: half day lost from work, office visit
- ◆ Outputs = estimates of hospital beds, HCWs needed
 - Best to run using multiple assumption options
 - Develop understanding of range vs likely needs

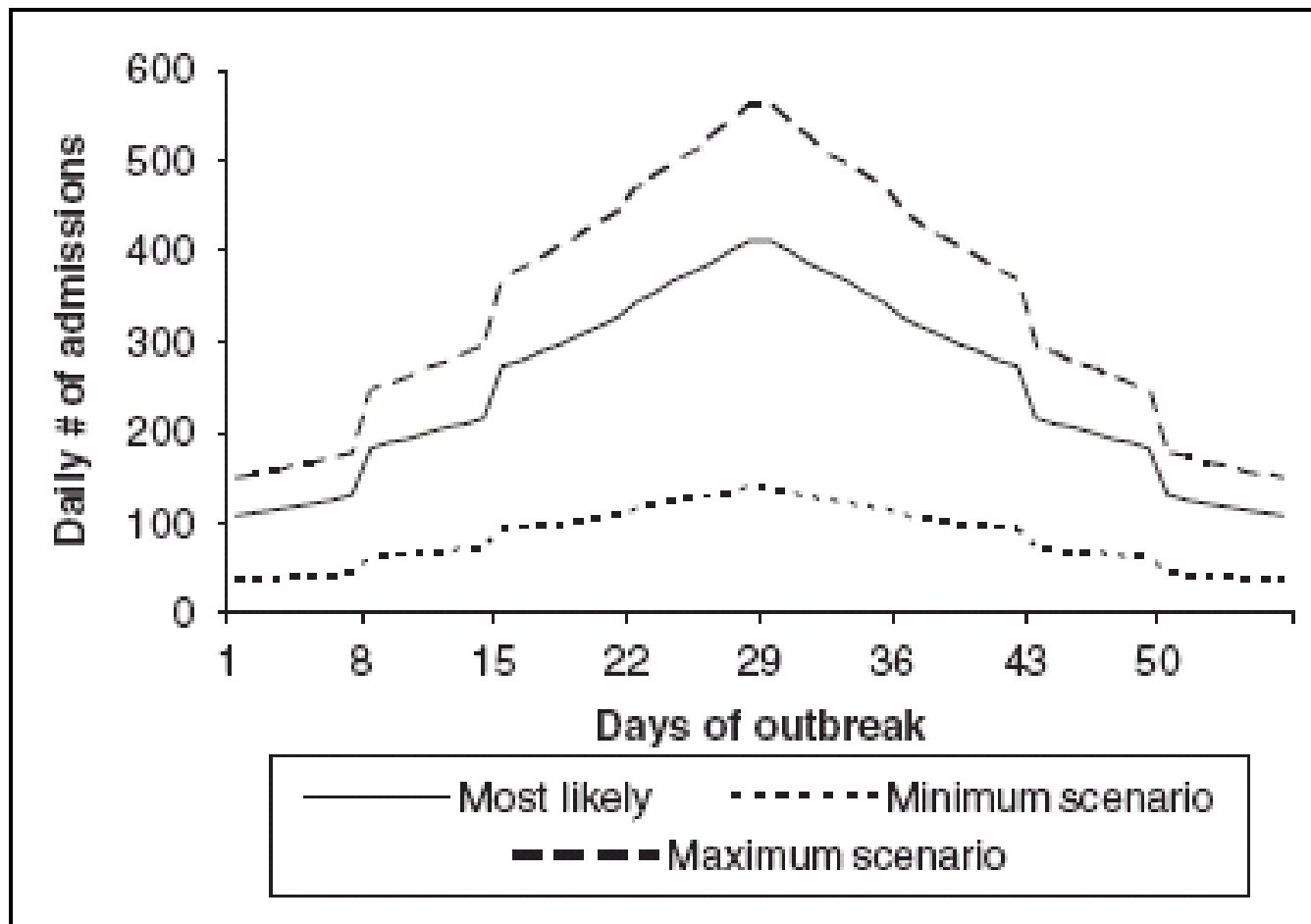
FluSurge Inputs

FluSurge2.0	Default [†]
Inputs	
Population of locale by age groups	
0–19	1,350,707
20–64	2,906,171
65+	353,154
Total licensed non-ICU beds	7300
Licensed non-ICU beds staffed (%)	100
Total licensed ICU beds	759
Licensed ICU beds staffed (%)	100
Total number of ventilators	691
Ventilators available (%)	100
Influenza pandemic duration (weeks) [*]	6, 8, 12
Gross clinical attack rate (%) [§]	15, 25, 35
Assumptions[¶]	
1. Average length of non-ICU hospital stay for influenza-related illness (days)	5
2. Average length of ICU stay for influenza-related illness (days)	10
3. Average length of ventilator usage for influenza-related illness (days)	10
4. Average proportion of admitted influenza patients will need ICU care (%)	15
5. Average proportion of admitted influenza patients will need ventilators (%)	7.5
6. Average proportion of influenza deaths assumed to be hospitalized (%)	70
7. Daily percentage increase in cases arriving compared to preceding day	3

Top inputs = Metropolitan Atlanta data, early 2000s

More goodies from cdc.gov/flu/tools

- ◆ CommunityFlu software program
 - Simulates spread of influenza through a model community
 - Estimates impact of potential interventions
 - Vaccinations, school closings, face masks
 - Patient and household isolation/self quarantine
 - Calculates the costs of illness and interventions
- ◆ FluWorkLoss estimates the days lost from work due to an influenza pandemic
 - Worker illness
 - Worker staying home to care for a family member

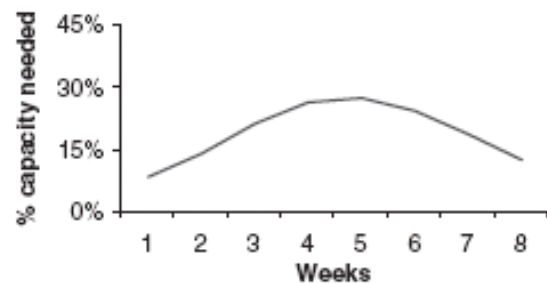


Example
of
FluSurge
output

Figure 1 The daily distribution of hospital admissions due to an 8-week influenza pandemic with 25% attack rate† (Metropolitan Atlanta).*

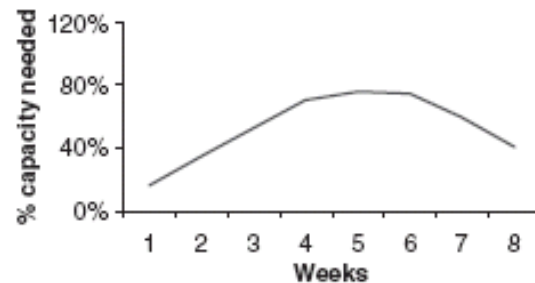
Zhang X, et al. FluSurge—A tool to estimate demand for hospital services during the next pandemic influenza. Med Decis Making 2006;26:617-23.

Hospital Capacity needed



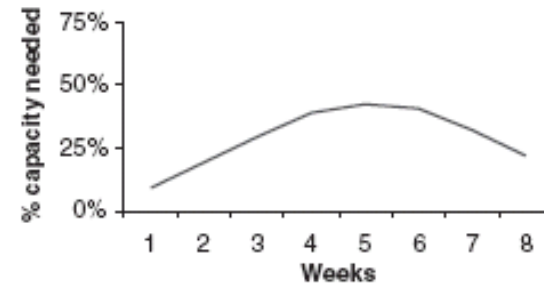
Hospital LOS = 5 days

ICU Capacity needed

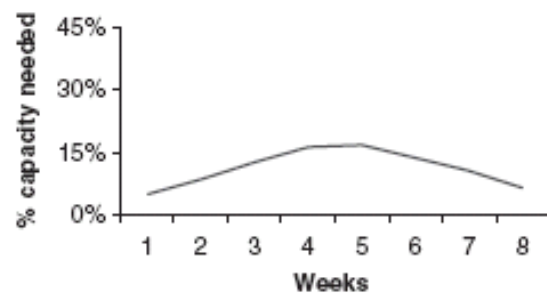


ICU LOS = 10 days

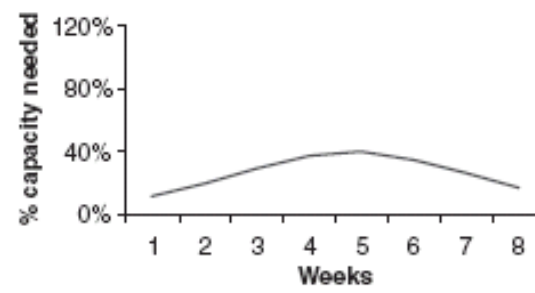
Ventilator Capacity needed



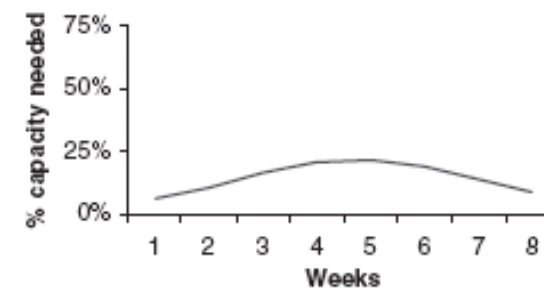
Ventilator LOS = 10 days



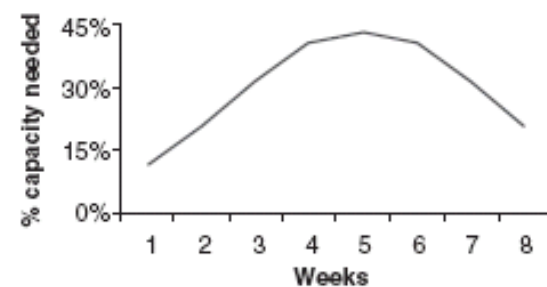
Hospital LOS = 3 days



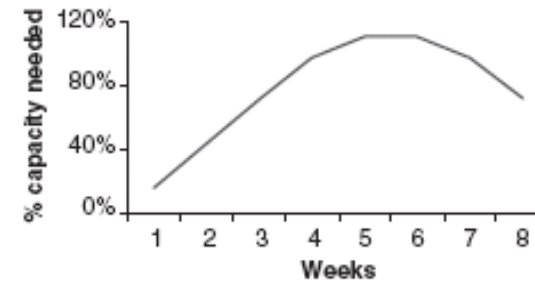
ICU LOS = 5 days



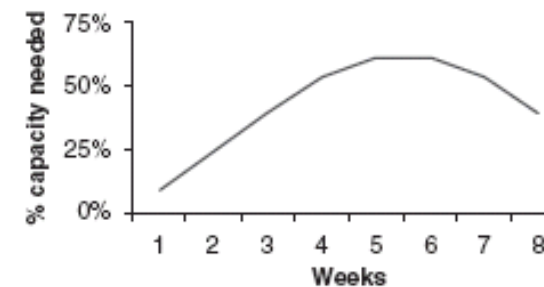
Ventilator LOS = 5 days



Hospital LOS = 8 days



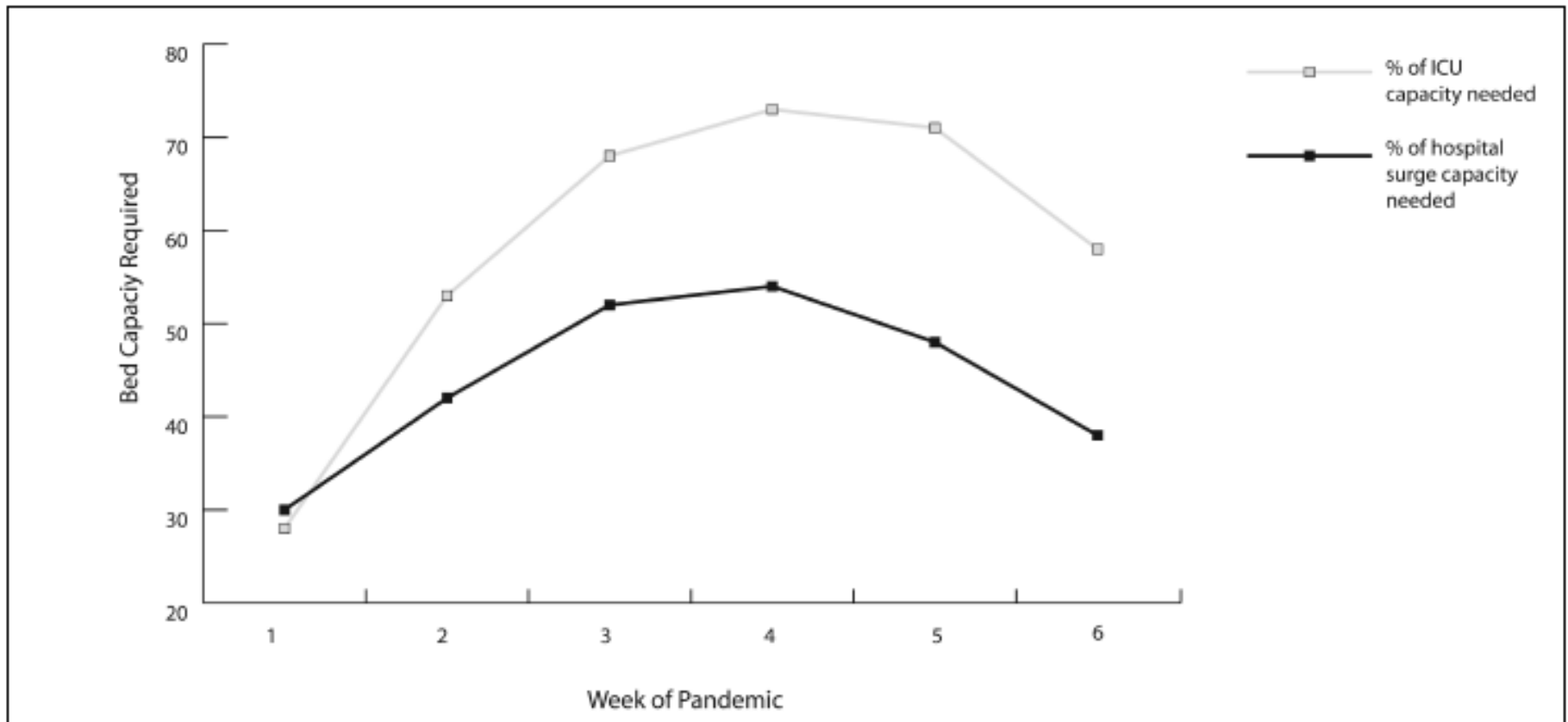
ICU LOS = 15 days



Ventilator LOS = 15 days

Metro Atlanta – 8 week, 25% attack rate assumptions

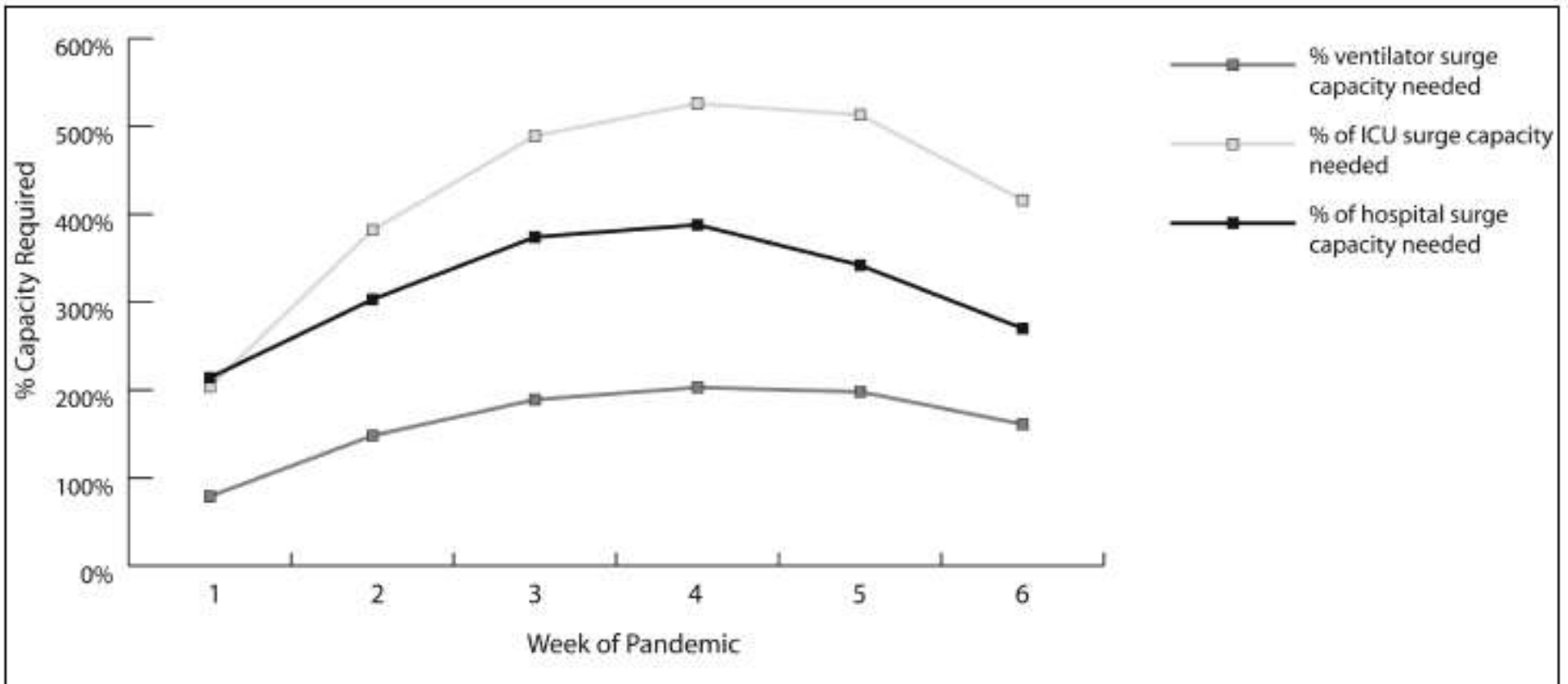
Projected utilization of surge capacities using FluSurge assumptions for avian flu



Ten Eyck © 2008 Prehospital and Disaster Medicine

Ten Eyck R. Ability of regional hospitals to meet projected avian flu pandemic surge capacity requirements. Prehospital Disast Med 2008;23:103-112.

Projected utilization of surge capacities using FluSurge assumptions for 1918-like flu

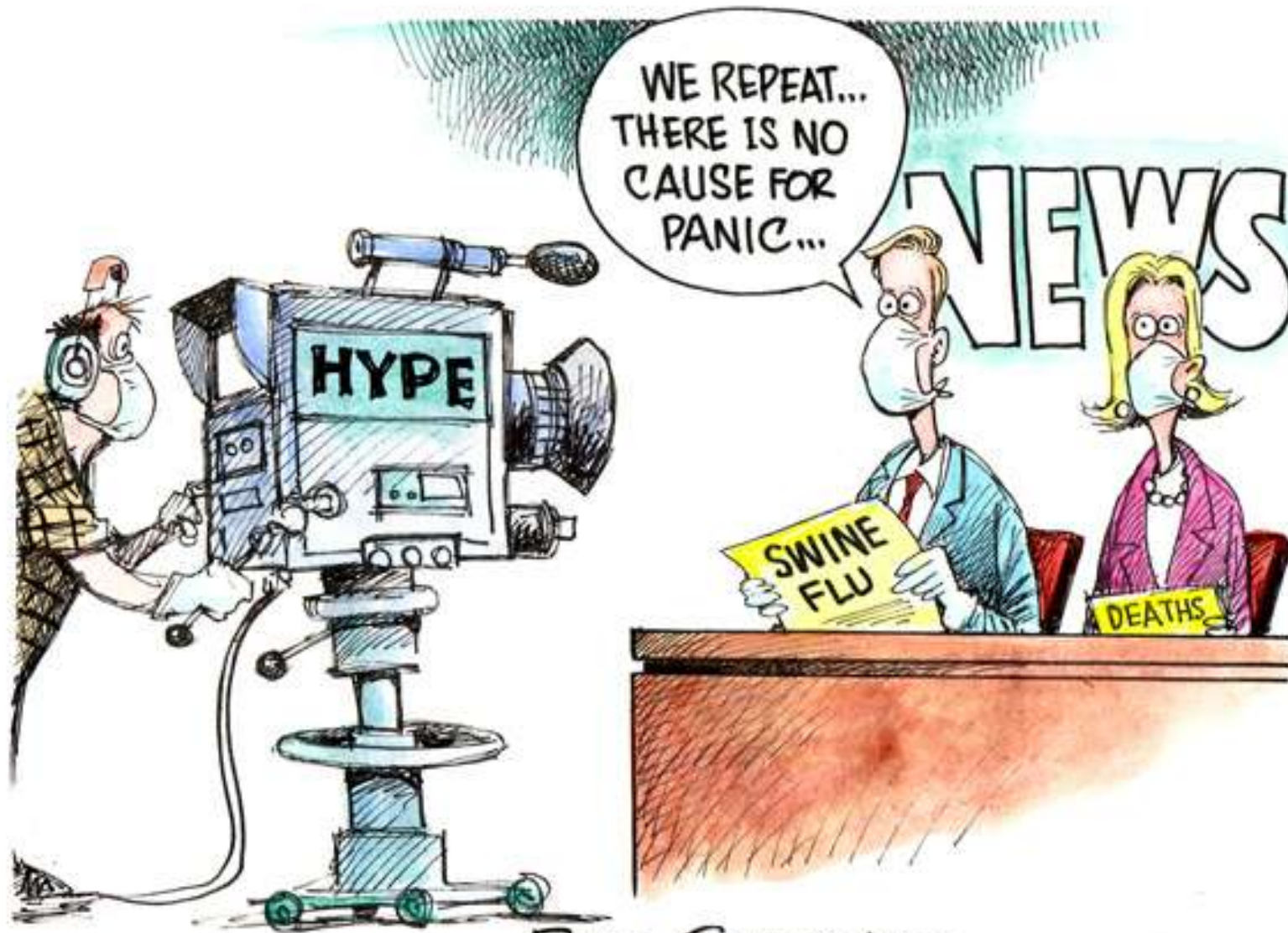


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Ten Eyck R. Ability of regional hospitals to meet projected avian flu pandemic surge capacity requirements. Prehospital Disast Med 2008;23:103-112.

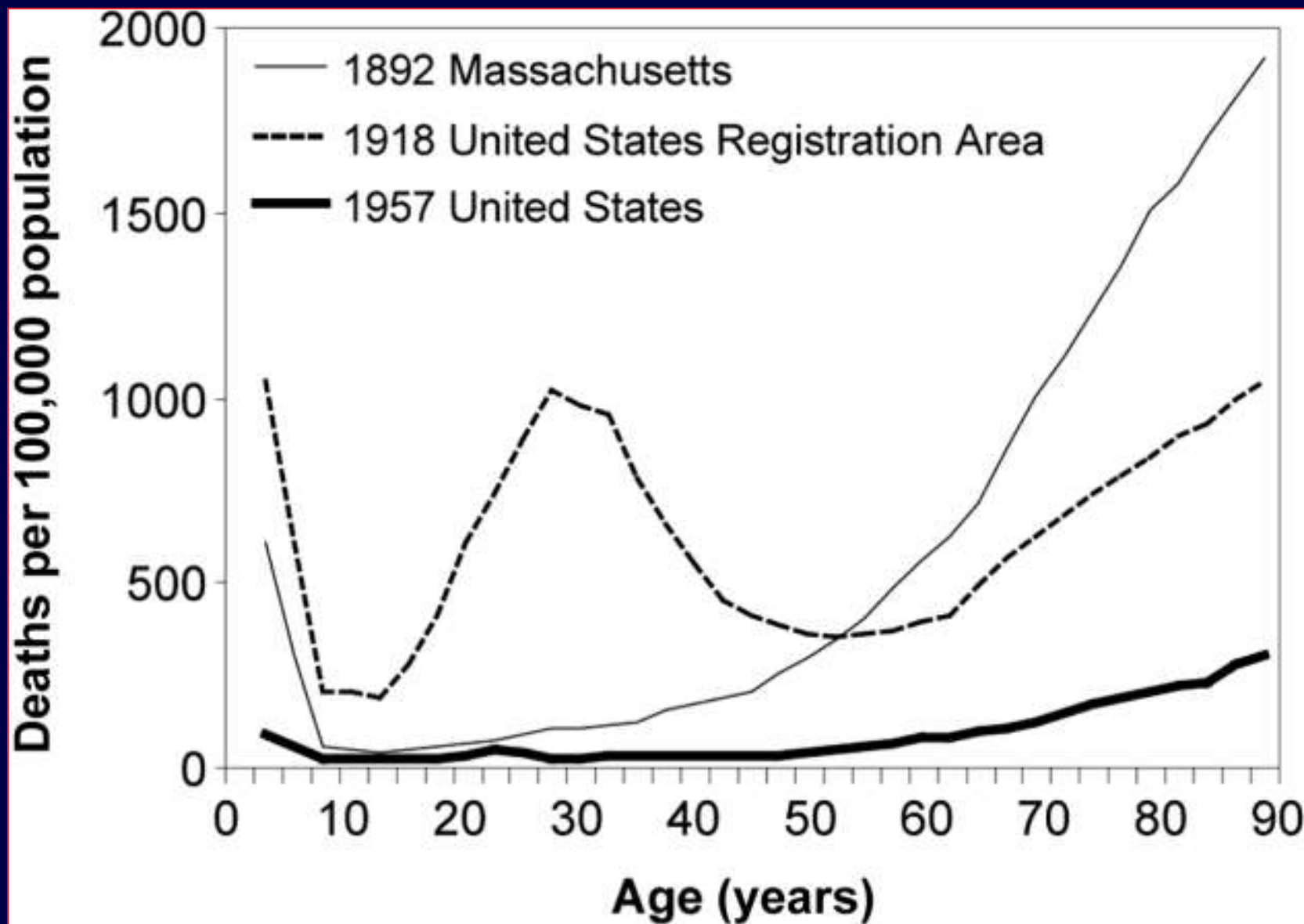
Good news vs bad

- ◆ Current modeling suggests a mild pandemic would stress local healthcare systems severely
 - but with basic surge efforts, ICU and non-ICU adults could be managed adequately in most settings
 - Impressions from CDC, other sources
 - Sobieraj JA et al. *Military Med* 2007;172:486
- ◆ Moderate to severe pandemic would overwhelm existing resources
 - 12 week pandemic with 35% attack rate
 - Maximum beds, ventilators 'exceeded' in 2-3 wks
 - Peak ICU bed need = 785% of capacity,
non-ICU = 214%, ventilators = 392%



DAVE GRANLUND © www.davegranlund.com

Pandemic “W” vs “U”



The Journal of Pediatrics • August 2005

INVITED
COMMENTARY

THE NEXT INFLUENZA PANDEMIC: WILL WE BE READY TO CARE FOR OUR CHILDREN?

CHARLES R. WOODS, MD, MS, AND JON S. ABRAMSON, MD

In 2004, we were struck with another influenza surprise—almost half of the expected influenza vaccine supplies was not available because of contamination during the manufacturing process. The Centers for Disease Control and Prevention (CDC) responded quickly to recommend that high-risk groups be given first priority for vaccine and to divert vaccine stocks to areas experiencing short supplies.¹ This event occurred against the backdrop of a widespread

WHAT ABOUT PANDEMIC PLANS FOR CHILDREN?

The various problems that need to be addressed before the arrival of a pandemic are broad in scope. The draft of the National Pediatric Immunization Plan (N PIPP) begins to address many of these issues, but as welcome and detailed as it is, there is little discussion or guidance for addressing the varying needs of infants and young children (or

We were able to outline a lot of key questions in 2005, but the answers to many remain elusive...

Children \neq Small Adults

- ◆ Normal values for vital signs vary by age and size
- ◆ Medication doses based on weight (kg) or surface area
- ◆ Less physiologic reserve amongst the youngest
 - Lower glycogen stores in infants
 - Higher surface to mass ratio – heat loss, dehydration
- ◆ Atypical clinical manifestations versus adults

More unique characteristics of children - 1

- ◆ Absorb larger doses of toxic or infectious agents
 - More rapid respiratory rate, larger surface area
 - May acquire larger inocula (closer contact with others)
- ◆ Less 'flu history'
 - Less likely to have 'ancient' cross-protective antibodies from many prior years of exposure
- ◆ Need for two doses of vaccine in first full vaccine year

More unique characteristics of children - 2

- ◆ Children with special health care needs often require technological support for survival
 - If acquire influenza, many will require even more complex care
- ◆ High attack rates early on in seasonal influenza
 - Spread to others in the community
 - Healthcare-associated spread more difficult to control than adults
 - Young children have to be held
 - Young children cannot contain their secretions

More unique characteristics of children - 3

- ◆ Developmental limitations understanding how to respond in cooperative/collaborative manner with healthcare providers
 - Issue often exacerbated by psychological stress
- ◆ Dependence on adults for physical, emotional well-being
 - Social distancing not possible from primary caregivers
- ◆ Vulnerability to the mental health status of the parent

Pediatric Provider Surge Capacity

- ◆ Primary care
 - Eliminate well child care, but not routine vaccinations
 - Frees up MD, NP, PA time, likely not office nurses
- ◆ Subspecialists tend to be in short supply
 - 9-12 Pediatric Infectious Diseases Specialists in KY
 - All subspecialties taxed by complications in previously well and those with prior chronic illness/special needs
 - Surgeons busy with complications of secondary bacterial infections, IV access needs + 'routine issues'
 - Critical care providers, hospitalists, ED physicians...
- ◆ Tele-management will be essential

Other Pediatric Issues

- ◆ Some adult nurses will have to provide care to children
- ◆ Physical space issues must allow for parent/caregiver to be at bedside
- ◆ Food service is different for young children vs adults
- ◆ Infection control issues are more difficult
- ◆ Bed space is already limited statewide...
- ◆ Best to have 'pediatric surge beds' close by to any existing centers that can provide care to children
 - Small communities may not be able to dedicate specific beds to children...but should try to do so

Reimbursement Issues for All

Category	Problem	Potential solutions
10. Insurers	Increased patient volume stressing ability of office and insurer personnel to conduct “business as usual” and hinder efficient administrative responses ¹¹	Suspension of approval processes to free up hospital and insurance company personnel to deal with the other administrative demands of a pandemic.

Federal indemnification of a proportion of pandemic-related costs may be necessary for financial survival of some health care systems, as well as for some insurers. Health insurers may need to explore how other insurers manage payments to those affected by large local natural disasters.

**Woods CR, Abramson JS.
J Pediatr 2005;147:157-55**





**Occupational
Safety and Health
Administration**

www.osha.gov

**Pandemic Influenza Preparedness
and Response Guidance for
Healthcare Workers and Healthcare Employers**

OSHA 3328-05 2007

Surge development must focus on safety of surge providers and staff, not only on patients...

Physicians, other lead providers may be called up on to take some degree of personal risk for the sake of patients...

Occupational Health Services

- + Incorporate institutional occupational health services into pandemic preparedness.
- + Develop surveillance, screening and treatment protocols.
- + Coordinate with local, state and federal agencies for access and recommendations for administration of antiviral medications and pandemic influenza vaccination.
- + Ensure that all employees and volunteers are safely integrated into the healthcare facility.

General Duty Clause

In addition to compliance with the hazard-specific safety and health standards, employers must provide their employees with a workplace free from recognized hazards likely to cause death or serious physical harm. Employers can be cited for violating the General Duty Clause of the OSH Act if they do not take reasonable steps to abate or address such recognized hazards.²

Respiratory Protection Standard - 29 CFR 1910.134

The primary objective of OSHA's Respiratory Protection standard is to protect employees against inhalation of harmful airborne substances or oxygen-deficient air. This standard applies to all occupational airborne exposures where employees are exposed to a hazardous level of an airborne contaminant. The inhalation of pathogenic organisms known to cause human disease is covered by this standard.

Personal Protective Equipment Standard - 29 CFR 1910.132

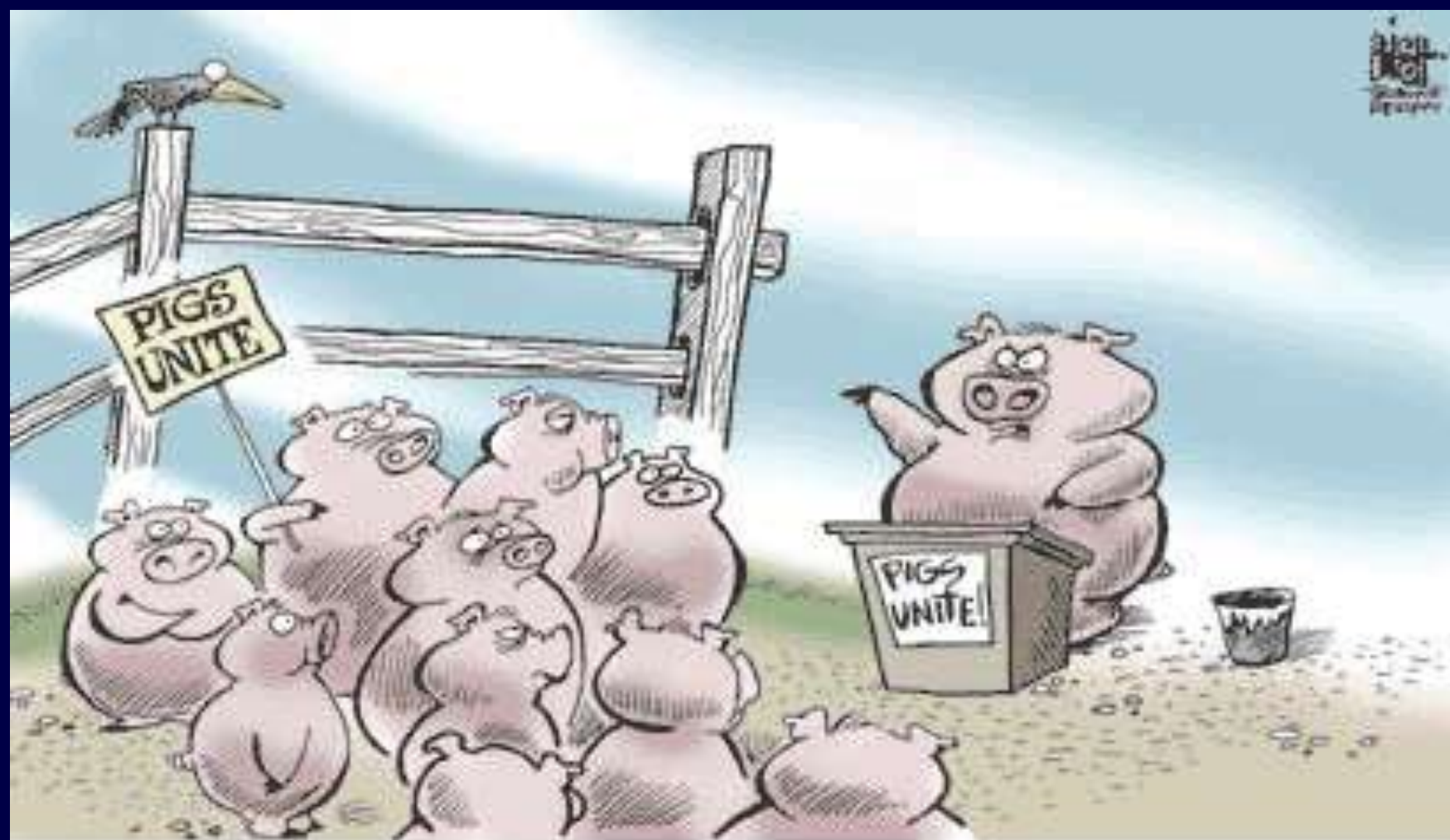
When engineering controls, work practices, and administrative controls are infeasible or do not provide sufficient protection, employers must provide appropriate personal protective equipment (PPE) and ensure its proper use. PPE is worn to minimize exposure to a variety of workplace hazards. PPE can include protection for eyes, face, head, and extremities. Gowns, face shields, gloves, and respirators are examples of commonly used PPE within healthcare facilities.

Bloodborne Pathogens Standard - 29 CFR 1910.1030

More on OSHA Standards & Security

Security

- + Security will be an essential requirement during a pandemic.
- + Train security personnel on specific roles and pandemic scenarios.
- + Ensure that security personnel have adequate infection control resources.
- + Integrate facility security with local and state law enforcement agencies to ensure adequate protection and support of the healthcare facility and employees.
- + Inform and train employees about expected security measures during a pandemic.



THE TURKEYS HAVE BIRD FLU. THE COWS HAVE MAD COW DISEASE.
I'M TELLING YOU, BOYS... UNLESS WE WANT TO SEE MORE HAM SERVED
ON THANKSGIVING, WE'RE GOING TO HAVE TO GET OUR OWN DISEASE!